

## CLAIMS

What is claimed is:

1. A method for determining whether a gene product is involved in preventing a replication error in a cell, the method comprising:  
providing a cell with a specific inhibitor for a gene product; and  
determining the expression level of a marker gene in the cell, wherein the expression level of the marker gene is dependent on the occurrence of a replication error.
2. The method according to claim 1, wherein the replication error comprises a nucleic acid repeat instability.
3. The method according to claim 1, wherein the specific inhibitor for a gene product comprises using gene-specific RNAi.
4. The method according to claim 3, wherein the specific inhibitor for a gene product comprises gene-specific double-stranded RNAi.
5. The method according to claim 1, wherein the cell is present in a non-human organism.
6. The method according to claim 5, wherein said organism comprises *C. elegans*.
7. The method according to claim 1, further comprising providing the marker gene to the cell.
8. The method according to claim 7, wherein the marker gene comprises *LacZ*.

9. The method according to claim 1, wherein the expression level of the marker gene is dependent on a nucleic acid repeat in the marker gene.

10. The method according to claim 9, wherein the repeat, or an incorrect repair of the repeat, results in a frame-shift within the coding region of the marker gene.

11. The method according to claim 10, wherein the frame-shift results in a functional protein.

12. The method according to claim 11, wherein an activity of the functional protein is detected.

13. The method according to claim 12, wherein the activity comprises  $\beta$ -galactosidase activity.

14. The method according to claim 1, further comprising identifying a gene involved in preventing nucleic acid repeat instability in the cell.

15. An isolated and/or recombinant gene produced by the process comprising  
providing a cell with a specific inhibitor for a gene product; and  
determining the expression level of a marker gene in the cell, wherein the expression level of the marker gene is dependent on the occurrence of a replication error; and  
identifying a gene involved in preventing nucleic acid repeat instability in the cell.

16. The isolated and/or recombinant gene according to claim 15, wherein the gene is selected from the group consisting of at least one of Y71F9AL.1/18, F26E4.6, C01A2.3, F22D6.4, F55A12.3, E01A2.2, F25H2.9, C36B1.4, F39H11.5, M04F3.1, B0511.8, D1081.8, F02E9.4, R06C7.7, H26D21.2, Y47G6A.11, Y71F9AL.18, F55A12.3, E01A2.2, F26E4.6, C01A2.3, F22D6.4, F25H2.9, C36B1.4, F39H11.5, T02H6.11, F54D10.1, K07D4.3, C17G10.4, C25H3.3, C25H3.4, C32D5.6, T19D12.5, B0495.2, F49E12.6, T10B9.5, R06F6.8a, R03D7.2, F32A11.2, B0412.3, R74.4, F20H11.5, T26A5.5, B0361.1, H14A12.3, T23G5.6, Y56A3A.29, T28D6.4, Y111B2A.1, Y76A2B.5, Y43F4B.1, ZK520.3, Y56A3A.33, Y39A3CL.4a, Y62E10A.6, F29C4.6, AC8.1, F15E6.1, K08D10.2, T05A12.4, C33D9.5, K08F4.1, K08E7.7, K09B11.2, F14F9.5, F44C4.4, ZC196.6, ZK856.1, C06H2.3, F08H9.4, F43D2.1, C30G7.1, C25D7.6, F28E4.1, Y113G7A.9, W07A8.3, F57C12.2, F19G12.2, R07E4.2, C09B8.6, F45E1.6, C44C10.2, F46G10.3, F02D10.7, C53A5.3, C35A5.9, H12C20.2a, and T28A8.7.

17. A method for determining whether a cell is predisposed to display a nucleic acid repeat instability phenotype, the method comprising:

determining functional expression of a gene according to claim 15, or an equivalent or homologue thereof, in a cell.

18. A method according to claim 17, wherein the cell is in a non-human organism.

19. A method according to claim 17, wherein the cell is present in a clinical sample.

20. A method according to claim 19, further comprising determining whether an individual is predisposed to display a nucleic acid repeat instability phenotype.

21. A method according to claim 19, further comprising determining whether the cell is a cancer cell.

22. A kit for determining whether a cell is predisposed to display a nucleic acid repeat instability phenotype, comprising a means for determining functional expression of a gene selected from the group consisting of at least one of Y71F9AL.1/18, F26E4.6, C01A2.3, F22D6.4, F55A12.3, E01A2.2, F25H2.9, C36B1.4, F39H11.5, M04F3.1, B0511.8, D1081.8, F02E9.4, R06C7.7, H26D21.2, Y47G6A.11, Y71F9AL.18, F55A12.3, E01A2.2, F26E4.6, C01A2.3, F22D6.4, F25H2.9, C36B1.4, F39H11.5, T02H6.11, F54D10.1, K07D4.3, C17G10.4, C25H3.3, C25H3.4, C32D5.6, T19D12.5, B0495.2, F49E12.6, T10B9.5, R06F6.8a, R03D7.2, F32A11.2, B0412.3, R74.4, F20H11.5, T26A5.5, B0361.1, H14A12.3, T23G5.6, Y56A3A.29, T28D6.4, Y111B2A.1, Y76A2B.5, Y43F4B.1, ZK520.3, Y56A3A.33, Y39A3CL.4a, Y62E10A.6, F29C4.6, AC8.1, F15E6.1, K08D10.2, T05A12.4, C33D9.5, K08F4.1, K08E7.7, K09B11.2, F14F9.5, F44C4.4, ZC196.6, ZK856.1, C06H2.3, F08H9.4, F43D2.1, C30G7.1, C25D7.6, F28E4.1, Y113G7A.9, W07A8.3, F57C12.2, F19G12.2, R07E4.2, C09B8.6, F45E1.6, C44C10.2, F46G10.3, F02D10.7, C53A5.3, C35A5.9, H12C20.2a, T28A8.7 and an equivalent or homologue thereof.

23. A kit according to claim 22, comprising an antibody specific for a gene product of the gene.

24. A kit according to claim 22, comprising a probe for the gene.

25. A kit according to claim 22, comprising a means for obtaining a sequence of the gene.

26. A method for determining whether a compound is capable of influencing a process involved in preventing a replication error in a cell, the method comprising:

providing a cell with a compound; and

determining the expression level of a marker gene in the cell, wherein the expression level of the marker gene is dependent on a replication error.

27. A method according to claim 26, further comprising providing the cell with a specific inhibitor for the expression of a gene involved in preventing a replication error in the cell.

28. A method according to claim 27, wherein the gene involved in preventing a replication error in the cell, is a gene selected from the group consisting of at least one of Y71F9AL.1/18, F26E4.6, C01A2.3, F22D6.4, F55A12.3, E01A2.2, F25H2.9, C36B1.4, F39H11.5, M04F3.1, B0511.8, D1081.8, F02E9.4, R06C7.7, H26D21.2, Y47G6A.11, Y71F9AL.18, F55A12.3, E01A2.2, F26E4.6, C01A2.3, F22D6.4, F25H2.9, C36B1.4, F39H11.5, T02H6.11, F54D10.1, K07D4.3, C17G10.4, C25H3.3, C25H3.4, C32D5.6, T19D12.5, B0495.2, F49E12.6, T10B9.5, R06F6.8a, R03D7.2, F32A11.2, B0412.3, R74.4, F20H11.5, T26A5.5, B0361.1, H14A12.3, T23G5.6, Y56A3A.29, T28D6.4, Y111B2A.1, Y76A2B.5, Y43F4B.1, ZK520.3, Y56A3A.33, Y39A3CL.4a, Y62E10A.6, F29C4.6, AC8.1, F15E6.1, K08D10.2, T05A12.4, C33D9.5, K08F4.1, K08E7.7, K09B11.2, F14F9.5, F44C4.4, ZC196.6, ZK856.1, C06H2.3, F08H9.4, F43D2.1, C30G7.1, C25D7.6, F28E4.1, Y113G7A.9, W07A8.3, F57C12.2, F19G12.2, R07E4.2, C09B8.6, F45E1.6, C44C10.2, F46G10.3, F02D10.7, C53A5.3, C35A5.9, H12C20.2a, T28A8.7 and an equivalent or homologue thereof.

29. A gene delivery vehicle comprising a nucleic acid according to claim 15.

30. A method for influencing a process involved in preventing a replication error in a cell comprising providing the cell with a gene delivery vehicle according to claim 29.

31. A method of treating a subject, comprising administering to a subject the a gene delivery vehicle according to claim 29.

32. The non-human animal comprising a marker gene wherein the level of expression of said marker gene is dependent on the occurrence of said replication error.

33. The non-human animal according to claim 32 wherein the marker gene is provided to cells of the animal.

34. The non-human animal according to claim 33, wherein the animal is transgenic for the marker gene.

35. The method according to claim 26, further comprising providing a non-human animal having the marker gene and determining in the animal or progeny thereof whether the expression level of the marker gene is altered.

36. The method according to claim 35, wherein the non-human animal comprises *C. elegans*.

37. The method according to claim 36, wherein said compound comprises RNAi, or a free radical.

38. The method according to claim 37, wherein said RNAi is specific for a gene selected from the group consisting of at least one of Y71F9AL.1/18, F26E4.6, C01A2.3, F22D6.4, F55A12.3, E01A2.2, F25H2.9, C36B1.4, F39H11.5, M04F3.1, B0511.8, D1081.8, F02E9.4, R06C7.7, H26D21.2, Y47G6A.11, Y71F9AL.18, F55A12.3, E01A2.2, F26E4.6, C01A2.3, F22D6.4, F25H2.9, C36B1.4, F39H11.5, T02H6.11, F54D10.1, K07D4.3, C17G10.4, C25H3.3, C25H3.4, C32D5.6, T19D12.5, B0495.2, F49E12.6, T10B9.5, R06F6.8a, R03D7.2, F32A11.2, B0412.3, R74.4, F20H11.5, T26A5.5, B0361.1, H14A12.3, T23G5.6, Y56A3A.29, T28D6.4, Y111B2A.1, Y76A2B.5, Y43F4B.1, ZK520.3, Y56A3A.33, Y39A3CL.4a, Y62E10A.6, F29C4.6, AC8.1, F15E6.1, K08D10.2, T05A12.4, C33D9.5, K08F4.1, K08E7.7, K09B11.2, F14F9.5, F44C4.4, ZC196.6, ZK856.1, C06H2.3, F08H9.4, F43D2.1, C30G7.1, C25D7.6, F28E4.1, Y113G7A.9, W07A8.3, F57C12.2, F19G12.2, R07E4.2, C09B8.6, F45E1.6, C44C10.2, F46G10.3, F02D10.7, C53A5.3, C35A5.9, H12C20.2a, and T28A8.7.

39. A method for typing a cell, the method comprising:

determining, in a sample having a cell, the functional expression of a gene selected from the group consisting of at least one of Y71F9AL.1/18, F26E4.6, C01A2.3, F22D6.4, F55A12.3, E01A2.2, F25H2.9, C36B1.4, F39H11.5, M04F3.1, B0511.8, D1081.8, F02E9.4, R06C7.7, H26D21.2, Y47G6A.11, Y71F9AL.18, F55A12.3, E01A2.2, F26E4.6, C01A2.3, F22D6.4, F25H2.9, C36B1.4, F39H11.5, T02H6.11, F54D10.1, K07D4.3, C17G10.4, C25H3.3, C25H3.4, C32D5.6, T19D12.5, B0495.2, F49E12.6, T10B9.5, R06F6.8a, R03D7.2, F32A11.2, B0412.3, R74.4, F20H11.5, T26A5.5, B0361.1, H14A12.3, T23G5.6, Y56A3A.29, T28D6.4, Y111B2A.1, Y76A2B.5, Y43F4B.1, ZK520.3, Y56A3A.33, Y39A3CL.4a, Y62E10A.6, F29C4.6, AC8.1, F15E6.1, K08D10.2, T05A12.4, C33D9.5, K08F4.1, K08E7.7, K09B11.2, F14F9.5, F44C4.4, ZC196.6, ZK856.1, C06H2.3, F08H9.4, F43D2.1, C30G7.1, C25D7.6, F28E4.1, Y113G7A.9, W07A8.3, F57C12.2, F19G12.2, R07E4.2, C09B8.6, F45E1.6, C44C10.2, F46G10.3, F02D10.7, C53A5.3, C35A5.9, H12C20.2a, T28A8.7 and an equivalent or homologue thereof; and  
comparing the functional expression of the gene with a reference sample.